Advanced Techniques for Non-Collocated Fault Detetion of Satellite Formations, Phase I

Completed Technology Project (2013 - 2013)

Project Introduction

This proposal is for the development of a dynamic fault detection filter for a formation of satellites operating in a highly nonlinear dynamic environment but processed at a ground station where measurement data may be available on an intermittent basis. A previous SBIR study demonstrates that nonlinearities have an adverse effect on a linear dynamic filter's ability to accurately declare faults. Thus, a fault detection filter capable of effectively accounting for nonlinear dynamics and measurement data interruptions is required. During the proposed Phase I effort, such filters will be designed for faults in the three translational modes of 4 satellites flying in formation near a highly elliptical orbit. The satellites will carry a limited suite of instruments, just sufficient to determine faults in the three translational modes and include a GPS receiver. Furthermore, communication with a ground station will only be available near perigee and the measurement data will be transmitted in bursts, which will introduce planned and unplanned communication blackouts that represent breaks in the time history of measurements. The proposed development will produce a fault detection and isolation algorithm that can mitigate these breaks and perform faster than a simple, cyclical restart implementation.

Primary U.S. Work Locations and Key Partners
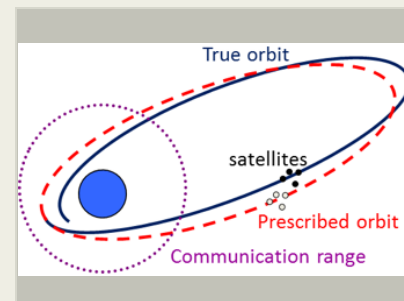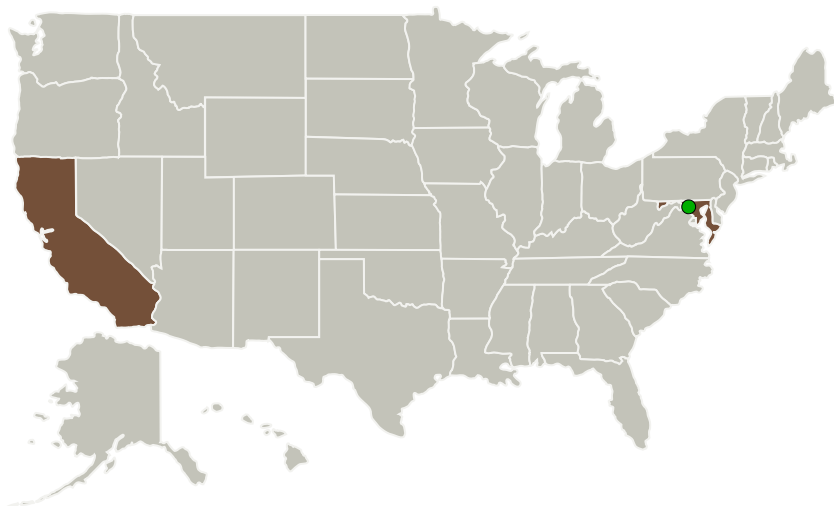
Advanced Techniques for Non-Collocated Fault Detetion of Satellite Formations

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| Organizations Performing Work	Role	Type	Location
SySense, Inc.	Lead Organization	Industry	El Segundo, California
🟢 Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
California	Maryland

Project Transitions

▶️ **May 2013:** Project Start

✅ **November 2013:** Closed out

Closeout Documentation:
- Final Summary Chart*(https://techport.nasa.gov/file/140712)*
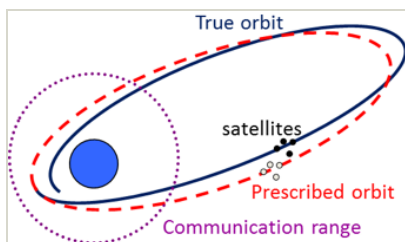
Images

Project Image
Advanced Techniques for Non-Collocated Fault Detetion of Satellite Formations
(https://techport.nasa.gov/image/127140)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

SySense, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
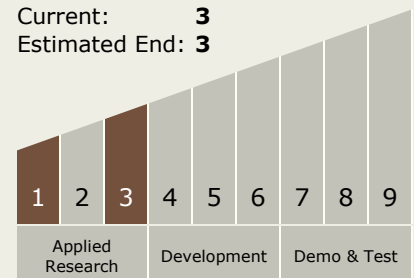
Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Sung M Kang

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**

1	2	3	4	5	6	7	8	9
Applied Research			Development			Demo & Test		

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Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  └ TX17.2 Navigation Technologies
    └ TX17.2.3 Navigation Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System